

Light Pollution

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1. Introduction to Light Pollution
 - a. Increasing use of artificial light at night (ALAN) within the past 100 years has started disrupting diurnal and nocturnal cycles.
 - b. ALAN effects humans, plants, and animals.
 - c. It's possible to light our nighttime worlds smartly with minimal impact.
 - d. Darkness and dark skies are still a largely unappreciated resource by managing agencies, towns, and the public at large.
2. Conceptualization of Light Pollution
 - a. Light pollution is a broad topic that means different things to different people.
 - b. Two categories of light pollution:
 - i. Light that washes out dark skies and creates glare due to lights that aren't fully cutoff or shielded (decreases darkness in the sky & can be seen from space).
 - ii. Light on the ground level that effects local animals, insects and plants due to light being too intense (effects hormonal patterns in humans and animals, as well as plant growth).
3. Light Pollution — Environmental & Ecological Health
 - a. The greatest amount of light pollution research is within the natural sciences.
 - b. Plants and animals depend on diurnal and nocturnal cycles for normal biological functions; ALAN disrupts these rhythms.
 - c. Disruptions are in a similar manner to the way chemicals in water confuse the biology of fish, or tall buildings kill birds on their migrations.
4. Light Pollution — Human Health
 - a. In June 2016, the American Medical Association issued a warning that high intensity LED streetlights can disturb human sleep rhythms in similar ways to how they disturb animals. This can lead to serious health conditions, including hormonal cancers and cardiovascular disease.
 - b. Cool blue LED lights have the greatest effect because they mimic bright blue skies of daylight.
 - c. Low intensity warm LED lights are a good alternative; they can save money while still having a marginal effect on human health.
5. Light Pollution — Wasted Energy & Money
 - a. Light pollution is by definition unintended and a waste. All of the money and energy that went into creating the light is wasted.
 - b. According to the International Dark Sky Association (IDA), about 30% of all energy produced for night lighting is wasted. This costs the United States around \$3.3 billion dollars annually.
 - c. Offsetting all of the wasted energy used on light pollution would require the planting of 875 million trees annually.
6. Light Pollution — Night Sky Heritage
 - a. Darkness and the night sky influence our culture, and something culturally is lost when we lose that darkness and our connection to the universe.
 - b. Historically, darkness and the night sky have influenced science, religion, philosophy, and art.
 - c. 90% of American children live in areas where they can never see the Milky Way because of light pollution.

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- d. It's hard to quantify what we lose culturally when we lose the night sky and darkness to light pollution, but surely we lose something.
- 7. Major Theories of Light Pollution
 - a. Managing is complicated, as it is a transboundary, multi-jurisdictional issue. Light from point sources travels between 50 and 200 miles, meaning that collaborations of different towns and organizations is needed to best address the issue.
 - b. Population is the greatest indicator of levels of light pollution on a macro scale, but on a micro scale, land use and the dominant industry is the best indicator. Nottingham vs. Epping.
 - c. Light pollution is increasing persistently regardless of location. Most areas see a 0 to 20% increase yearly. Globally, light pollution is increasing at an average of 6% per year. To put that into perspective, CO₂ emissions are increasing less than 1% each year globally.
- 8. Reducing Light Pollution is Easy
 - a. Light pollution is fundamentally different than most environmental issues due to the fact that it is fully reversible.
 - b. Decreasing light pollution also saves money for all of those who are involved.
 - c. We have the solution already;
 - i. Use low emitting bulbs
 - ii. Use different lighting fixtures that only light the intended area (fully shielded)
 - iii. Put lights on timers or motion sensors so they're only in use when needed
- 9. Future Steps?
 - a. Apply to have Nottingham join the short list of 14 International Dark-Sky certified communities.
 - b. The quality of Nottingham's sky's is mostly a byproduct of the towns and cities near us (remember; point sources of light pollution travel between 50 and 200 miles). Despite this, Nottingham has the opportunity to become a leader. Nottingham could relatively easily become the first IDA certified community on the East Coast of the United States.
 - c. It's a 1 - 2 year process to become Dark Sky certified. The major requirements are that we have IDA approved lighting ordinances in place and do public outreach related to dark skies or light pollution. This would help create a sense of community, increase community involvement, and create publicity/visibility for our small town.
 - i. The library could host programs, documentary showings, or promote their newly acquired telescope.
 - ii. The Conservation Commission could host night walks with natural ecology lessons.
 - d. Get in touch with the Portsmouth, NH chapter of the IDA for more information and resources.
- 10. Flagstaff, AZ as a Model
 - a. In 2001 it became the first IDA certified community.
 - b. Has controlled its light pollution without compromising the city's growth and economic development.

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Resources — Books

- *Ecological Consequences of Artificial Night Lighting* — Anthology of natural sciences research related to ALAN.
- *Let There Be Night* — Anthology of short stories related to darkness, the stars, and light pollution.
- *The End of Night* — Non-fiction book on the disappearance of true darkness and its effects on human health, society, and ecosystems.

Resources — Websites

- *DarkSky.org* — Official website for the International Dark-Sky Association.
- *DarkSiteFinder.com* — Interactive map showing local light pollution levels across the globe.
- *GlobeAtNight.org* — An international scientific research program that crowdsources measurements of light pollution in the night sky.
- *FLAP.org* — Fatal Light Awareness Program works to educate and engage individuals about bird fatalities related to migration.
- *NELPAG.org* — Volunteer group founded in 1993 to educate the public on the issue of light pollution.